

11/PRTS

10/500914

DT04 Rec'd PCT/PTO 08 JUL 2004

## SPECIFICATION

### BLADE SUPPORTING APPARATUS IN WIPER APPARATUS

#### Technical Field

The present invention relates to a technical field of a blade supporting apparatus in a wiper apparatus which is equipped in a vehicle such as a private car, a truck, a bus or the like.

#### Background Art

In general, in this kind of wiper apparatus, there is a structure made such that a wiper blade provided in a leading end portion of a wiper arm reciprocates and reverse so as to wipe a window surface on the basis of normal and reverse rotation of a wiper shaft integrally mounted to a base end portion of the wiper arm. In this wiper apparatus, the structure is generally made such that a middle portion of the wiper blade is pivoted to the leading end portion of the wiper arm via a pivot substantially orthogonal to an arm length direction so as to freely oscillate, and the wiper blade wipes the window surface following to the reciprocal and reverse oscillation of the wiper arm in correspondence to the normal and reverse rotation of the wiper shaft. In this wiper apparatus, for example, in the case that a long wiper blade wipes the window surface in a large-size wiper apparatus, or in the case that a range of the reciprocal and reverse oscillation is made wide, or the like, there is a case that a terminal end side corresponding to a portion in the side of the wiper shaft of the wiper blade tends to be

late in a wiping speed in comparison with the leading end side, whereby a following property to the wiper arm is deteriorated.

Then, it is proposed to support the terminal end side of the wiper blade by a supporting member provided in the wiper arm so as to increase the following property to the wiper arm, for example, there is a structure described in Japanese Patent National Publication of Translated Version 2001-501893. The supporting member in this structure is fixed to the wiper arm, and is structured such as to support the wiper blade in one side in the oscillating direction of the wiper arm. In this case, in recent years, the window surface tends to be formed in a curved shape, and the wiper blade oscillates in a direction of the window surface (a direction of moving close to or apart from the window surface) around the pivot corresponding to a supporting point with respect to the wiper arm. Accordingly, in this wiper apparatus, the structure is made such that a supporting concave portion constituting the supporting member and formed in a concave groove shape is provided in one side of the wiper arm, a support receiving body is integrally provided in the side of the wiper blade, and the support receiving body is slidably inward fitted into the supporting concave portion, thereby allowing the wiper blade to oscillate in the window surface direction.

In this case, the conventional supporting member mentioned above is structured such that the support receiving body oscillates in the window surface direction within the supporting concave portion, however, the supporting concave portion and the support receiving body are in a surface-to-surface contact

state with each other. Accordingly, when the wiper blade oscillates in the window surface direction, the support receiving body slides within the supporting concave portion in a surface-to-surface contact manner, a sliding resistance is generated between the support receiving body and the supporting concave portion, and there is a risk that a smooth oscillation of the wiper blade is deteriorated, which is problematic. Further, in this wiper apparatus, since each of the wiper arm fixing portion, the supporting concave portion and the support receiving body is structured as one unit in a connecting state, there are problems that the wiper apparatus is deteriorated in design due to an exposure of the supporting member as well as a structure of the supporting member becomes complex and large sized. Thus, these are problems to be solved by the present invention.

#### Disclosure of Invention

The present invention is made by taking the matters mentioned above into consideration and intending to solve the problems. According to the present invention, there is provided a wiper apparatus in which a wiper blade mounted to a leading end portion of a wiper arm wipes a window surface in correspondence to a normal and reverse rotation of a wiper shaft integrally mounted to a base end portion of the wiper arm, wherein a middle portion of the wiper blade is pivotably supported by the leading end portion of the wiper arm via a pivot substantially orthogonal to an arm length direction so as to freely oscillate and a

supporting member provided in the wiper arm supports movably the portion of the wiper blade nearer to the wiper shaft side than the middle portion of the wiper blade in a window surface direction, said supporting member comprising a supporting concave portion formed in the supporting member so as to support the wiper blade and a plurality of ribs elongated in the window surface direction formed on an inner surface of the supporting concave portion so as to be linear contact with the wiper blade.

In accordance with the structure mentioned above, since the movement of the wiper blade with respect to the supporting member is performed in a linear contact state, whereby a sliding resistance is reduced, a smooth wiping operation can be performed, and it is possible to increase a durability.

In this structure, the supporting member according to the present invention can be structured such that an upper piece portion constituting the supporting concave portion is fixed to the wiper arm.

Further, in this structure, the wiper arm according to the present invention can be structured such that a base end portion of an arm piece in which the wiper blade is mounted to a leading end portion thereof is fixed to a leading end portion of an arm shank formed in a substantially C shape in a cross section in such a manner as to be inward fitted, and the supporting member is fixed to the base end portion of the arm piece via a bolt screwed from an inside of the supporting concave portion, and is fixed to the leading end portion of the arm shank together with the arm piece. Accordingly, almost a whole of the supporting

member including the screwed portion by the bolt is covered by the wiper arm, and it is possible to obtain a structure excellent in design.

In this structure, the wiper apparatus can be structured such that a positioning means for fitting the arm piece in a positioning manner is formed in an assembling portion of the supporting member with the arm piece according to the present invention. In this manner, it is possible to improve an assembling accuracy of the supporting member.

Furthermore, in this structure, the positioning means according to the present invention can be constituted by a pair of protruding pieces faced to an arm length direction of the wiper arm and a protruding piece orthogonal to the arm length direction and against which a base end edge of the arm piece is struck, and is used also as anti-vibration means for preventing a stabilizer from vibrating with respect to the arm piece. In this way, the structure can be made such as to be provided with both functions of positioning and vibration preventing. Accordingly, it is possible to intend to use the member commonly.

Moreover, in this structure, the supporting member according to the present invention can be structured such as to support a blade lever constituting the wiper blade, and a support receiving body inward fitted to the supporting concave portion of the supporting member is provided in a supporting portion of the blade lever in a come-off preventing manner.

In addition, in this structure, the supporting portion of the blade lever by the supporting member according to the

present invention is disposed near a pivot portion pivoting a first lever connected to the wiper arm and a second lever, and at least one rib in the supporting concave portion is structured such as to oppose to a pin fastened to the pivot portion.

In this structure, a through hole allowing both end portions of a pin pivoting the first lever and the second lever to protrude and to expose to the outside is opened in the support receiving body according to the present invention.

Further, in this structure, the support receiving body according to the present invention can be structured such that the support receiving body is open on the window surface side to be formed in a substantially C cross sectional shape, and the support receiving body is provided with a fitting and attaching portion fitting to the pivot portion pivoting the first lever and the second lever, and an extension portion extended from the fitting and attaching portion so as to be interfered with the second lever and regulating a movement of the second lever in a wiping direction. In this way, it is possible to increase a following property of the wiper blade with respect to the wiper arm via the stabilizer in a stable state with no play.

Furthermore, in this structure, the fitting and attaching portion of the support receiving body according to the present invention is formed thinner than the extension portion, and the structure can be made such that the fitting to the first lever is achieved by an elastic deformation of the fitting and attaching portion. This makes it possible to simply and easily perform the mounting operation of the support receiving body.

Moreover, in this structure, the structure can be made such that a first step portion engaging with the first lever in the window surface direction so as to achieve a come-off prevention and a second step portion engaging with the first lever in the lever length direction so as to achieve a come-off prevention are formed in the fitting and attaching portion of the support receiving body according to the present invention. In this manner, it is possible to fix the support receiving body to the wiper blade in a come-off preventing manner.

In addition, in this structure, the second step portion according to the present invention can be formed so as to be positioned at both end portions of the first step portion in the lever length direction.

Further, in this structure, at least one second step portion according to the present invention can be continuously formed in the first step portion.

#### Brief Description of Drawings

FIG. 1 is a front elevational view of a wiper apparatus;  
FIG. 2A is a front elevational view of a part of a wiper arm;

FIG. 2B is a side elevational view of FIG. 2A;  
FIG. 3A is a side elevational view of a wiper blade;  
FIG. 3B is a cross sectional view along a line X-X in FIG. 3A;

FIG. 4A is a front elevational view of a stabilizer;  
FIG. 4B is a side elevational view of the stabilizer;

FIG. 4C is a cross sectional view along a line X-X in FIG. 4A;

FIG. 5 is a cross sectional view of a stabilizer mounting portion in the wiper arm;

FIG. 6A is a cross sectional view which describes a stabilizer mounting state of the wiper arm;

FIG. 6B is a partly cross sectional view which describes a relation between the stabilizer and the wiper blade;

FIG. 7A is a perspective view of the stabilizer;

FIG. 7B is an exploded perspective view which shows an assembling state of the stabilizer into the arm piece;

FIG. 8A is a side elevational view of a support receiving body;

FIG. 8B is a plan view of the support receiving body;

FIG. 8C is a bottom elevational view of the support receiving body;

FIG. 8D is a cross sectional view along a line X-X in FIG. 8A;

FIG. 9A is a front elevational view of the support receiving body;

FIG. 9B is a side elevation cross sectional view of the support receiving body;

FIG. 9C is a cross sectional view along a line X-X in FIG. 9B;

FIG. 10 is a side elevational view which describes a fitting state between a first lever terminal end portion and the support receiving body;



FIG. 11A is a front elevational view of a second embodiment which describes a mounting state between an arm piece and a stabilizer;

FIG. 11B is a side elevation cross sectional view of the second embodiment which describes the mounting state of the arm piece and the stabilizer;

FIG. 11C is a front elevational view of a third embodiment which describes a mounting state of an arm piece and a stabilizer; and

FIG. 11D is a side elevation cross sectional view of the third embodiment which describes the mounting state of the arm piece and the stabilizer.

#### Best Mode for Carrying Out the Invention

A description will be given next of an embodiment according to the present invention with reference to FIGS. 1 to 10.

In the drawings, reference numeral 1 denotes a wiper arm of a wiper apparatus. A base end portion of the wiper arm 1 is integrally fastened to a pivot shaft (a wiper shaft) 2 rotatably supported to a vehicle main body. Further, the wiper arm 1 reciprocally and reversely oscillates on the basis of normal and reverse rotation of the pivot shaft 2, whereby a wiper blade 3 mounted to a leading end portion of the wiper arm 1 performs a wiping operation of a window surface. This structure is the same as the conventional structure.

The wiper arm 1 comprises: an arm support 4 a base end portion of which is integrally mounted to the pivot shaft 2;

an arm shank 5 a base end portion of which is supported to a leading end portion of the arm support 4 via a pin 4a supported in orthogonal to an arm length direction, the arm shank 5 being connected so as to freely swing in a direction moving close to or apart from the window surface (a window surface direction); and an arm piece 6 a base end portion of which is integrally connected to the leading end portion of the arm shank 5 so as to be covered by the leading end portion of the arm shank 5. Further, a supporting portion 6a which is bent in a U shape is formed in the leading end portion of the arm piece 6, and the structure is made such that the wiper blade 3 is connected and supported to the supporting portion 6a. In addition, the wiper arm 1 is structured such that a spring member 7 is provided between the leading end portion of the arm support 4 and the base end side of the arm shank 5 via a hook 7a, and that the supporting portion 6a in the leading end side of the arm piece 6 is urged toward a window surface side.

On the other hand, the wiper blade 3 is formed in a long shape, and is constituted by a blade rubber 8 made of rubber, and a blade lever 9 supporting the blade rubber 8. The blade lever 9 is provided for supporting a plurality of portions in a longitudinal direction of the blade rubber 8. In this structure, a first lever 10 constituting the blade lever 9 is provided with a pin 10a in a middle portion in a longitudinal direction, and a clip 10b for connecting to the wiper arm 1 is swingably pivoted to the pin 10a. Further, middle portions in a longitudinal direction of second levers 11 are swingably pivoted to both end

portions 10c, 10d in a longitudinal direction of the first lever 10 via pins 10e. In this structure, it is set such that a stabilizer 13 mentioned below is outward fitted to a first lever terminal end portion 10d corresponding to an end portion at the wiper shaft 2 side, among both end portions of the first lever 10. Furthermore, middle portions in a longitudinal direction of four third levers 12 are swingably pivoted to both end portions of a pair of second levers 11 via pins 11a, respectively. In this structure, it is set such that supporting piece portions 12a integrally formed in both end portions of the third levers 12 fixedly support upper end portions disposed at eight portions in a longitudinal direction of the blade rubber 8 (portions in a side moving part from the window surface direction). The wiper blade 3 structured in the manner mentioned above is set such that connection to the wiper arm 1 can be achieved by detachably engaging the clip 10b of the first lever 10 constituting the blade lever 9 with the arm piece supporting portion 6a.

The arm shank 5 is provided with an upper piece portion 5a opposing to the window surface and a pair of side piece portions 5b extending to the window surface side from both side edge portions (side edge portions of the wiper arm 1 in a swinging direction) of the upper piece portion 5a, and is formed in a substantially C cross sectional shape. Further, the base end portion of the arm piece 6 is fixed along an inner surface in the side of the leading end of the arm shank upper piece portion 5a, and is structured to be covered with the upper piece portion 5a. A fixing portion of the arm piece 6 to the arm shank 5 is

set such as to oppose to the first lever terminal end portion 10d of the wiper blade 3, and that a stabilizer 13 mentioned below (corresponding to the supporting member according to the present invention) is fixed to the first lever terminal end portion 10d.

The stabilizer 13 is provided with an upper piece portion 13a opposing to the window surface and a pair of side piece portions 13b extending to the window surface side from both side edge portions of the upper piece portion 13a, and is formed as a supporting concave portion having a substantially C cross sectional shape. In addition, a protruding portion 13c protruding to an upper side from an outer peripheral edge portion except the leading end side is integrally formed in the upper piece portion 13a of the stabilizer 13, and a mounting concave portion 13d is formed on an upper surface of the upper piece portion 13a. The protruding piece 13c is set in a size corresponding to a thickness of the arm piece 6, and the structure is made such that an upper surface of the arm piece 6 and an upper end edge portion of the protruding piece 13c are substantially flush formed at a time of fitting the base end portion of the arm piece 6 into the concave portion 13d.

At this time, in the stabilizer 13, the protruding piece 13c positioned in a base end side of the mounting concave portion 13d functions as positioning means. The protruding piece 13c formed in an orthogonal state to the arm length direction is struck against the base end edge portion of the arm piece 6, so that it is possible to position the stabilizer 13 in an arm

length direction with respect to the arm piece 6. Further, the positioning in the oscillating direction is performed by a pair of opposing protruding pieces 13c, and at the same time the opposing protruding pieces 13c function as oscillation preventing means (rotation preventing means) of the stabilizer with respect to the arm piece 6. In this assembled state, it is set such that the stabilizer 13 and the arm piece 6 are fixed by screwing a bolt 14 inserted from the inside of the stabilizer 13 into a through hole 13e of the stabilizer upper piece portion 13a and a through hole 6b of the base end portion of the arm 6. Note that reference numeral 13f denotes a collar provided in the through hole 13e in the side of the stabilizer 13.

Then, the stabilizer 13 is assembled in the wiper arm 1 by fixing the base end portion of the arm piece 6 having the stabilizer 13 assembled therein described above, to the inner surface of the leading end portion in the arm shank upper piece portion 5a. A positioning protruding portion 5c slightly protruding is formed in an inner surface of the arm shank upper piece portion 5a, and on the other hand, a bent portion 6c is formed in the base end portion of the arm piece 6, and the arm piece bent portion 6c is fixed along the positioning protruding portion 5c, so that the arm piece 6 can be positioned in the arm length direction with respect to the arm shank.

At this time, a step portion 13g is formed on an outer surface of the stabilizer side piece portion 13b, and it is set such that the lower end edge (the leading end edge) of the arm shank side piece portion 5b strikes an upper side surface of

the step portion 13g, thereby being supported to both side pieces 13b of the stabilizer by both side pieces 5b of the arm shank. In addition, it is set such that the stabilizer 13 can be positioned in the window surface direction with respect to the arm shank 5.

In this state, the stabilizer 13 is mounted to the wiper arm 1 in a state of being positioned in the arm length direction and positioned in the window surface direction. Accordingly, a positional relation is established so that the terminal end side of the wiper blade 3 connected to the arm piece supporting portion 6a, that is, the first lever terminal end portion 10d opposes to the mounting position of the stabilizer 13, as mentioned above.

On the other hand, reference numeral 15 denotes a support receiving body interposed between the stabilizer 13 in the side of the wiper arm 1 and the wiper blade 3, and the support receiving body 15 is set to be previously fixed to the first lever terminal end portion 10d.

The support receiving body 15 is structured such that a fitting and attaching portion P1 fixed to a pivot portion pivoting a first lever 10 and a second lever 11 in a come-off prevention manner, which corresponds to the first lever terminal end portion 10d of the wiper blade 3, and an extension portion P2 extending to a leading end side of the fitting and attaching portion P1, that is, to a side of the wiper shaft 2 and opposing to the second lever 11 are integrally formed, and the support receiving body 15 is set to a size in which a whole thereof is covered by the

stabilizer 13 being outward fitted. Further, the support receiving body 15 is formed in a substantially C cross sectional shape by an upper piece portion 15a opposing to the window surface, and a pair of side piece portions 15b extending to the window surface direction from both right and left side edges of the upper piece portion 15a, and is structured such that the side piece portion 13b of the stabilizer 13 is outward fitted to an outer surface which is formed in a flat plate shape in a pair of side piece portions 15b.

Furthermore, the support receiving body 15 is fitted and attached in an outward fitting state by elastically deforming both side piece portions 15b in the corresponding portion to the fitting and attaching portion P1 so as to press into the first lever terminal end portion 10d, thereby being fixed. Hereat, throughholes 15c are provided in both side piece portions 15b in the corresponding portion to the fitting and attaching portion P1 of the support receiving body, and it is set such that an end portion protruding to the outside of the pivot pin 10e constituting the pivot portion of the first lever terminal end portion 10d and the second lever 11 is loosely fitted to the through hole 15c. In this case, the support receiving body 15 is set such that the outer surfaces of both side piece portions 15b of the support receiving body are substantially at the same positions as those of the both end portions of the pivot pin 10e seen from the through holes 15c, or at slightly retracted positions.

Moreover, an engagement hook (corresponding to a first step

portion according to the present invention) 15d, which engages with the first lever terminal end portion 10d in the window surface direction and which is used for preventing the first lever terminal end portion 10d from coming off, is provided in an inner surface of the lower end portion (the window surface side portion) of each of the side piece portions 15b, which corresponds to the opposing portion in the fitting and attaching portion P1 in, in the support receiving body 15, in such a manner as to protrude toward the inside. Further, in the support receiving body 15, a thick partition step portion (corresponding to the second step portion according to the present invention) 15e is formed in an inward protruding manner and in such a manner as to partition between the fitting and attaching portion P1 and the extension portion P2, that is, in the inner surfaces of both side piece portions 15b opposing to the leading end surface of the first lever terminal end portion 10d at a time of being fitted and fixed to the first lever terminal end portion 10d. In addition, a step portion (corresponding to a second step portion according to the present invention) 15f is formed in an inward protruding manner in each of the opposing portions to the fitting and attaching portion P1 of both side piece portions 15b in the support receiving body so as to be positioned in the inner surface of the base end side edge portion and be in a continuous state with the engagement hook 15d. Accordingly, in the mounting state mentioned above in which the support receiving body 15 is fitted and attached to the first lever terminal end portion 10d, a window surface side edge portion B1 in a rectangular pivot piece portion



B formed in the first lever terminal end portion 10d and the engagement hook 15d are in an engagement state in the window surface direction. Further, both end edge portions B2 and B3 in the lever length direction, and the partition step portion 15e and the step portion 15f are respectively in an engagement state in the lever length direction, whereby it is set such that the come-off prevention in the window surface direction and the lever length direction can be achieved and the positioning can be achieved.

The partition step portion 15e is formed on the basis of a difference in thickness between the fitting and attaching portion P1 and the extension portion P2, whereby the fitting and attaching portion P1 is formed so as to be thinner than the extension portion P2. Accordingly, it is possible to simply and easily perform the mounting operation of fitting and attaching the fitting and attaching portion P1 to the terminal end portion of the first lever 10d.

Note that, reference numeral 15g denotes a through hole opened in the upper piece portion 15a in the portion corresponding to the extension portion P2. The through hole 15g is formed for the purpose of preventing a bolt head 14a of the bolt 14 inserted from the inside so as to fasten the stabilizer 13 to the arm piece 6 from being interfered with the support receiving body 15 at a time when the window surface wiping operation is performed by the wiper apparatus and the stabilizer 13 oscillates in the window surface direction.

Further, the opposing distance between both side piece

portions 13b of the stabilizer 13 is set to a size which allows the support receiving body 15 to slidably move in the window surface direction, and the stabilizer 13 is mounted in a state of inward fitting the support receiving body 15 with a state of holding both side piece portions 15b of the support receiving body 15 between the inner surfaces of both side piece portions 13b. At this time, a plurality of (four in the case of the present embodiment) ribs 13h, which are long in the window surface direction and protrude to the inside, are formed on the inner surfaces of both side piece portions 13b of the stabilizer in such a manner as to be in parallel with the arm length direction. When the stabilizer 13 is outward fitted to the support receiving body 15, leading end portions of these ribs 13h are set to be elastically brought into contact with the flat outer surfaces of both side piece portions 15b in the support receiving body. In this mounting state, when the wiper arm 1 reciprocally oscillates, the terminal end portion of the wiper blade 3 is brought under control in moving in an oscillating direction by both side piece portions 13a of the stabilizer 13. Additionally, with respect to an oscillation of the wiper blade 3 in the window surface direction with respect to the wiper arm 1, it is set such that the oscillation is smoothly performed by allowing the leading end portions of the ribs 13h to slide along the outer surfaces of both side pieces 15b in the support receiving body. Accordingly, the oscillation of the wiper blade 3 in the window surface direction is achieved by the linear slide of the leading end portions of the ribs 13h in both side piece portions 13b

of the stabilizer with respect to the flat surface constituted by both side piece portions 15b of the support receiving body. Thereby it is set such that a sliding resistance which occurs between the stabilizer 13 and the support receiving body 15 is reduced, a movement regulation of the wiper blade 3 in the wiping and oscillating direction is not deteriorated, and a following characteristic with respect to the curved surface of the window surface is improved.

Moreover, a plurality of ribs 13h formed in the inner surfaces of both side piece portions 13b of the stabilizer are formed in a positional relation that the ribs are brought into contact with the outer surfaces of both side piece portions 15b of the support receiving body. A second rib 13h from the leading end side of the wiper arm 1 among the ribs 13h opposes the pin 10e seen from the through hole 15c of the support receiving body 15, and is formed so as to slightly protrude from the other ribs 13h. Accordingly, as shown in FIG. 6B, even when the support receiving body 15 is not provided in the wiper blade 3, the stabilizer 13 is set such that the second rib 13h is fitted and attached to the pin 10e in the side of the wiper blade 3 in a contact state.

In the embodiment according to the present invention structured in the manner mentioned above, in the structure obtained by connecting the wiper arm 1 to each of the arm support 4, the arm shank 5 and the arm piece 6, the stabilizer 13 is provided in the connection portion between the arm shank 5 corresponding to the leading end portion of the wiper arm 1 and

the arm piece 6. Further, a plurality of ribs 13h are formed on the inner surfaces of both side piece portions 13b of the stabilizer provided for supporting the wiper blade 3 so as to regulate the movement of the wiper blade 3, and the structure is made such that the protruding end portion of the rib 13h and the outer surface of the support receiving body 15 in the wiper blade 3 are brought into contact with each other in a linear contact manner. Accordingly, when the wiper blade 3 oscillates in the window surface direction along the curved surface of the window surface, the support receiving body 15 of the oscillating wiper blade 3 and the stabilizer 13 fixed to the wiper arm 1 slide in the linear contact state of the outer surfaces of both side pieces 15b with the protruding end portions of the ribs 13h. Then, the wiper blade 3 is allowed to oscillate in the window surface direction under the small sliding resistance while being effectively controlled by both side piece portions 13b of the stabilizer 13 in the wiping and oscillating direction. Therefore, the window surface wiping operation performed by the wiper blade 3 is not deteriorated, and is smoothly performed, so that improvement of a durability can be achieved and it is possible to provide a wiper apparatus having a high performance and a high quality.

Furthermore, in the structure where the present invention is applied, the stabilizer 13 is supported such that the upper piece portion 13a and the upper side portions of both side piece portions 13b for constructing the C cross sectional shape to support the wiper blade 13 are outward fitted within the concave

portion constituted by the upper piece portion 5a and both side piece portions 5b of the arm shank 5. Therefore, substantially a whole of the stabilizer 13 is covered with the arm shank 5 at a time of seeing from the outside of the window surface. Further, since substantially a whole of the support receiving body 15 in the side of the wiper blade 3 is covered by the stabilizer 13, the portion exposing to the outer portion is reduced in each of the members, and the structure excellent in design can be achieved.

In addition, in this structure, since the stabilizer 13 is previously screwed and fixed to the base end portion of the arm piece 6 via the bolt 14, and the screwed and fixed portion is positioned at the portion along the inner surface of the upper piece portion 5a in the leading end portion of the arm shank 5, the screwed and fixed portion is covered with the arm shank upper piece portion 5a. As a result, the screwed and fixed portion and additionally the support receiving body 15 are not exposed to the rain or the like so as to improve a rust proof characteristic or the like, so that it is possible to increase a durability.

In this structure, the stabilizer 13 is mounted and fixed to the base end portion of the arm piece 6 in a state of fitting the base end portion of the arm piece 6 to the concave portion 13d formed by the protruding piece 13c formed in the upper piece portion 13a for the purpose of constituting the positioning means and the vibration preventing means. Accordingly, a pair of protruding pieces 13c above both side piece portions 13b are

brought into contact with both side surfaces of the arm piece 6, whereby the stabilizer 13 is positioned and prevented from oscillating in the wiping and oscillating direction. In addition, the stabilizer 13 is positioned in the arm length direction by the protruding piece 13c orthogonal to the arm length direction in the base end side, so that the mounting accuracy of the stabilizer 13 is improved, the stabilizer 13 has no play with respect to the wiper arm 1, and it is possible to obtain a good following characteristic.

Further, when the arm piece 6, to which the stabilizer 13 is mounted in the no play state mentioned above, is mounted to the arm shank 5, the stabilizer 13 is provided so as to be fitted to the concave portion having the C cross sectional shape in the arm shank 5, and both of the side piece portions 5b hold the upper portion all around the longitudinal direction of the stabilizer side piece portion 13b. Accordingly, there is no problem that the stabilizer 13 has a play with respect to the arm shank 5, and in the case that the oscillating load by the wiper blade 3 is applied, the load can be borne by a whole of the stabilizer in the longitudinal direction, thereby achieving improvement of a durability.

In the structure to which the present invention is applied, the stabilizer 13 is provided in the wiper blade 3 via the support receiving body 15, whereby the oscillation (sliding) of the stabilizer 13 in the window surface direction is carried out between the stabilizer and both side piece portions 15b of the support receiving body. In this case, since the outer surface

of each of the side piece portions 15b is formed in the flat shape, it is possible to make a relative oscillation with respect to the rib 13h of the stabilizer 13 smooth and small in sliding resistance. Further, in this structure, the support receiving body 15 is structured such that the extension portion P2 is formed in the fitting and attaching portion P1 fitted and attached to the first lever terminal end portion 10d, and the extension portion P2 is structured such as to regulate the movement of the second lever 11 pivoted to the first lever 10 in the oscillating direction in such a manner as to oppose to the portion in the side of the wiper shaft 2 of the second lever 11 pivoted to the first lever 10. Therefore, the following characteristic of the wiper blade 3 via the stabilizer 13 to the wiper arm can be further increased.

In addition, since the support receiving body 15 is structured such that the fitting and attaching portion P1 formed in a thin shape is fitted and attached to the first lever terminal end portion 10d on the basis of the elastic deformation, the mounting operation to the first lever 10d is simply and easily performed.

Also, the support receiving body 15 is formed different in the outer shape between the fitting and attaching portion P1 opposing to the side of the first lever 10 and the extension portion P2 opposing to the side of the second lever 12, and asymmetrical in the lever length direction. Therefore, it is possible to reduce the trouble that the support receiving body 15 is mounted to the wiper blade 3 in wrong direction, and

improvement of an assembling characteristic can be achieved.

Further, in both side piece portions 15a of the support receiving body 15, the engagement hook 15d engages with the window surface side edge portion B1 of the rectangular pivot piece portion B formed in the first lever terminal end portion 10d, and the partition step portion 15e and the step portion 15f respectively engage with both end edge portions B2 and B3 in the lever length direction, whereby the come-off prevention is achieved in both directions comprising the window surface direction and the arm length direction. As a result, the support receiving body 15 is securely fixed to the first lever terminal end portion 10d, and it is possible to avoid the trouble such as the dropout or the like.

Note that it goes without saying that the present invention is not limited to the embodiment mentioned above, and the positioning means and the vibration preventing means between the stabilizer and the wiper arm may be structured as follows.

That is, in a structure in accordance with a second embodiment shown in FIGS. 11A and 11B, a through hole 16a for fixing a stabilizer 17 to a base end side is opened in a portion corresponding to a stabilizer 17 mounting portion in an arm piece 16, and another through hole (a second through hole) 16b is opened so as to be positioned in more leading end side than the through hole 16a. On the other hand, a protruding portion 17b protruding toward an upper side from an upper surface of an upper piece portion 17a is integrally formed in the stabilizer 17. Further, the structure is made such that a positioning and an oscillation



prevention of the stabilizer 17 with respect to the arm piece 16 are carried out by fitting the protruding portion 17b into the arm piece second through hole 16b.

On the contrary, in a structure in accordance with a third embodiment shown in FIGS. 11C and 11D, a through hole 18a for fixing a stabilizer 19 to a base end side is opened in a portion corresponding to a stabilizer 19 mounting portion in an arm piece 18, and a protruding portion 18b protruding downwardly is formed so as to be positioned in more leading end side than the through hole 18a. On the other hand, a through hole 19b is opened in an upper piece portion 19a in the stabilizer 19, whereby the structure is made such that a positioning and an oscillation prevention of the stabilizer 19 with respect to the arm piece 18 are carried out by fitting the protruding portion 18b at the arm piece 18 side into the through hole 19b at the stabilizer 19 side.

As mentioned above, the arm piece and the stabilizer can construct the mutually positioning and oscillation preventing means by forming the engagement portions which are engaged with each other in a state of being displaced with respect to the screwing portion for fixing the arm piece and the stabilizer, and it is possible to make the following characteristic between the wiper arm and the wiper blade more excellent by providing the means.

#### Industrial Applicability

The present invention is useful in the field of the blade

supporting apparatus in the wiper apparatus which is equipped in the vehicle such as the private car, the truck, the bus or the like, in the case that the smooth wiping operation can be performed and the durability is intended to be increased; in the case that the design characteristic is intended to be excellent; in the case that the it is intended to improve the assembling accuracy of the supporting member; in the case that it is intended to commonly use the members; in the case that it is intended to increase the following characteristic of the wiper blade via the stabilizer with respect to the wiper arm in a stable state having no play; and the like.